

Replacement Claims

**WHAT IS CLAIMED IS:**

1. (amended) A method of forming a nitride barrier layer, comprising the steps of:
  - exposing a dielectric layer to a silicon-containing gas under low partial pressure to deposit a layer of silicon thereon; and
  - exposing the silicon layer to a nitrogen-containing gas to form a silicon nitride barrier layer.
2. (amended) The method of Claim 1, wherein the dielectric layer is exposed to the silicon-containing gas at a partial pressure of about  $10^{-2}$  Torr or less.
3. (amended) The method of Claim 1, wherein the dielectric layer is exposed to the silicon-containing gas at pressure of about  $10^{-2}$  to about  $10^{-7}$  Torr.
4. (amended) The method of Claim 2, wherein the dielectric layer is exposed to the silicon-containing gas at a temperature of about 500°C to about 700°C.
5. (amended) A method of forming a nitride barrier layer, comprising the steps of:
  - irradiating a dielectric layer with a silicon-containing gas under low partial pressure to nucleate the dielectric layer with a layer of silicon; and
  - exposing the silicon layer to a nitrogen-containing gas to form a silicon nitride barrier layer.
6. The method of Claim 5, wherein the silicon layer has a thickness of about 10 to about 30 angstroms.
7. (amended) A method of forming a nitride barrier layer, comprising the steps of:
  - exposing a dielectric layer to a silicon-containing gas under low partial pressure to deposit a layer of about 10 to about 30 angstroms silicon thereon; and

○                    ○

**Replacement Claims**

nitridizing the silicon layer in a nitrogen-containing gas to form a silicon nitride barrier layer.

8. (amended) A method of forming a nitride barrier layer, comprising the steps of:
- exposing a surface of a dielectric layer to a silicon-containing gas at a low partial pressure to nucleate the surface of the dielectric layer with a layer of silicon; and
- exposing the silicon layer to a nitrogen-containing gas to form a silicon nitride barrier layer.
9. (amended) A method of forming a nitride barrier layer, comprising the steps of:
- exposing a dielectric layer to a silicon-containing gas at a partial pressure of about  $10^{-2}$  Torr or less to deposit a layer of about 10 to about 30 angstroms silicon thereon; and
- nitridizing the silicon layer to form a silicon nitride barrier layer.
10. (amended) The method of Claim 9, wherein the dielectric layer is exposed to the silicon-containing gas at a temperature of about 500°C to about 700°C.
11. (amended) The method of Claim 9, wherein the silicon-containing gas is selected from the group consisting of dichlorosilane, silicon tetrachloride, silane, and disilane.
12. (amended) The method of Claim 9, wherein the step of exposing the dielectric layer to the silicon-containing gas is by plasma enhanced chemical vapor deposition, low pressure chemical vapor deposition, or rapid thermal chemical vapor deposition.
13. (amended) The method of Claim 9, wherein the silicon-containing gas is deposited by rapid thermal chemical vapor deposition at about 500°C. to about 700°C.
14. The method of Claim 9, wherein the dielectric layer comprises silicon dioxide.

**Replacement Claims**

15. The method of Claim 9, wherein the dielectric layer comprises a dielectric material selected from the group consisting of tantalum pentoxide, hafnium dioxide, and aluminum trioxide.

16. (amended) A method of forming a nitride barrier layer, comprising the steps of:

exposing a dielectric layer to a silicon-containing gas at a partial pressure of about  $10^{-2}$  to about  $10^{-7}$  Torr to nucleate the dielectric layer with a layer of silicon; and

exposing the silicon layer to a nitrogen-containing gas to form a silicon nitride barrier layer.

17. (amended) A method of forming a nitride barrier layer, comprising the steps of:

exposing a dielectric layer to a silicon-containing gas at a partial pressure of about  $10^{-2}$  to about  $10^{-7}$  Torr, a temperature of about 500°C. to about 700°C., and a duration of about 1 second to about 5 minutes, to nucleate the dielectric layer with a layer of silicon; and

exposing the silicon layer to a nitrogen-containing gas to form a silicon nitride barrier layer.

18. (amended) A method of forming a nitride barrier layer, comprising the steps of:

depositing a silicon layer onto a dielectric layer by exposing the dielectric layer to a silicon-containing gas under low partial pressure; and

thermally annealing the silicon layer in a nitrogen-containing gas.

19. (amended) A method of forming a nitride barrier layer, comprising the steps of:

depositing a silicon layer onto a dielectric layer by exposing the dielectric layer to a silicon-containing gas under low partial pressure; and

exposing the silicon layer to a nitrogen-containing gas at a temperature of about 700°C. to about 900°C. to nitridize the silicon layer.

○                    ○  
Replacement Claims

20. (amended) A method of forming a nitride barrier layer, comprising the steps of:

depositing a silicon layer onto a dielectric layer by exposing the dielectric layer to a silicon-containing gas under low partial pressure; and

exposing the silicon layer to a nitrogen-containing gas at a temperature of about 700°C. to about 900°C., a pressure of about 1 to about 760 Torr, and a flow rate of about 100 to about 10,000 sccm, for about 1 second to about 180 minutes to nitridize the silicon layer.

21. (amended) The method of Claim 20, wherein the nitrogen-containing gas is selected from the group consisting of nitrogen, ammonia, nitrogen trifluoride, nitrogen oxide, and a nitrogen-helium mixture.

22. The method of Claim 21, wherein the silicon layer is exposed to a plasma source of nitrogen.

23. (amended) A method of forming a nitride barrier layer, comprising the steps of:

depositing a silicon layer onto a dielectric layer by exposing the dielectric layer to a silicon-containing gas under low partial pressure; and

exposing the silicon layer to a plasma source of a nitrogen-containing gas to nitridize the silicon layer.

24. (amended) The method of Claim 23, wherein the plasma source of the nitrogen-containing gas is produced by a downstream microwave system, an electron cyclotron resonance system, an inductive coupled plasma system, or a radio frequency system.

25. (amended) A method of forming a nitride barrier layer, comprising the steps of:

depositing a silicon layer onto a dielectric layer by exposing the dielectric layer to a silicon-containing gas under low partial pressure; and

exposing the silicon layer to a remote microwave plasma source of a nitrogen-containing gas at a pressure of about 1 to about 20 Torr to nitridize the silicon layer.

**Replacement Claims**

26. (amended) A method of forming a nitride barrier layer, comprising the steps of:  
depositing a silicon layer onto a dielectric layer by exposing the dielectric layer to a silicon-containing gas under low partial pressure; and  
exposing the silicon layer to a remote microwave plasma source of a nitrogen-containing gas at a pressure of about 1 to about 20 Torr, and a temperature of about 700°C. to about 900°C. to nitridize the silicon layer.
27. (amended) A method of forming a nitride barrier layer, comprising the steps of:  
depositing a silicon layer onto a dielectric layer by exposing the dielectric layer to a silicon-containing gas under low partial pressure; and  
exposing the silicon layer to an inductive coupled plasma source of a nitrogen-containing gas at a pressure of about 1 to about 20 Torr to nitridize the silicon layer.
28. (amended) A method of forming a semiconductor device, comprising the steps of:  
irradiating a dielectric layer disposed on a silicon substrate with a silicon-containing gas under low partial pressure to nucleate the dielectric layer with a layer of silicon; and  
nitridizing the silicon layer.
29. (amended) The method of Claim 28, wherein the step of irradiating the dielectric layer with the silicon-containing gas is at a partial pressure about  $10^{-2}$  Torr or less.
30. The method of Claim 29, wherein the step of irradiating the dielectric layer is at a partial pressure of about  $10^{-2}$  to about  $10^{-7}$  Torr.
31. (amended) The method of Claim 29, wherein the silicon-containing gas is selected from the group consisting of dichlorosilane, silicon tetrachloride, silane, and disilane.

○                    ○

## Replacement Claims

32. (amended) The method of Claim 28, wherein the step of irradiating the dielectric layer with the silicon-containing gas is by plasma enhanced chemical vapor deposition, low pressure chemical vapor deposition, or rapid thermal chemical vapor deposition.

33. (amended) The method of Claim 28, wherein the step of irradiating the dielectric layer with the silicon-containing gas is by rapid thermal chemical vapor deposition at a temperature of about 500°C to about 700°C.

34. The method of Claim 28, wherein the dielectric layer comprises silicon dioxide.

35. The method of Claim 28, wherein the dielectric layer comprises a dielectric material selected from the group consisting of tantalum pentoxide, hafnium dioxide, and aluminum trioxide.

B 1  
36. (amended) A method of forming a semiconductor device, comprising the steps of:  
    exposing a dielectric layer disposed on a silicon substrate to a silicon-containing gas at a partial pressure of about  $10^{-2}$  Torr or less to nucleate the dielectric layer with a layer of silicon;  
    and  
    nitridizing the silicon layer in a nitrogen-containing gas.

37. (amended) A method of forming a semiconductor device, comprising the steps of:  
    exposing an oxide layer disposed on a silicon substrate to a silicon-containing gas at a partial pressure of about  $10^{-2}$  Torr or less to nucleate the dielectric layer with a layer of silicon;  
    and  
    thermally annealing the silicon layer in a nitrogen-containing gas.

○                            ○  
Replacement Claims

38. (amended) A method of forming a semiconductor device, comprising the steps of:  
exposing an oxide layer disposed on a silicon substrate to a silicon-containing gas at a partial pressure of about  $10^{-2}$  Torr or less to nucleate the dielectric layer with a layer of silicon; and  
exposing the silicon layer to a nitrogen-containing gas at a temperature of about 700°C. to about 900°C. to nitridize the silicon layer.

39. (amended) A method of forming a semiconductor device, comprising the steps of:  
depositing a silicon layer onto a dielectric layer by exposing the dielectric layer to a silicon-containing gas under low partial pressure to nucleate the dielectric layer with a layer of silicon; and  
exposing the silicon layer to a plasma source of a nitrogen-containing gas to nitridize the silicon layer.

*B1*  
40. (amended) The method of Claim 39, wherein the plasma source of the nitrogen-containing gas is produced by a downstream microwave system, an electron cyclotron resonance system, an inductive coupled plasma system, or a radio frequency system.

41. (amended) A method of forming a semiconductor device, comprising the steps of:  
depositing a silicon layer onto a dielectric layer by exposing the dielectric layer to a silicon-containing gas under low a partial pressure of about  $10^{-2}$  Torr or less to nucleate the dielectric layer with a layer of silicon; and  
exposing the silicon layer to a remote microwave plasma source of a nitrogen-containing gas at a pressure of about 1 to about 20 Torr to nitridize the silicon layer.

42. (amended) A method of forming a gate electrode, comprising the steps of:  
exposing a gate oxide layer disposed on a silicon substrate to a silicon-containing gas at a partial pressure of about  $10^{-2}$  Torr or less to nucleate the dielectric layer with a layer silicon; and

○                    ○

## Replacement Claims

exposing the silicon layer to a nitrogen-containing gas to form a silicon nitride barrier layer.

43. (amended) A method of forming a gate electrode, comprising the steps of:

exposing a gate oxide layer disposed on a silicon substrate to a silicon-containing gas at a partial pressure of about  $10^{-2}$  to about  $10^{-7}$  Torr to nucleate the dielectric layer with a layer of silicon; and

exposing the silicon layer to a nitrogen-containing gas to form a silicon nitride barrier layer.

44. (amended) A method of forming a gate electrode, comprising the steps of:

exposing a gate oxide layer disposed on a silicon substrate to a silicon-containing gas at a partial pressure of about  $10^{-2}$  to about  $10^{-7}$  Torr, a temperature of about 500°C. to about 700°C., and a duration of about 1 second to about 5 minutes, to nucleate the dielectric layer with a layer of silicon and

exposing the silicon layer to a nitrogen-containing gas to form a silicon nitride barrier layer.

45. (amended) A method of forming a gate electrode, comprising the steps of:

depositing a silicon layer onto a gate oxide layer disposed on a silicon substrate by exposing the gate oxide layer to a silicon-containing gas at a partial pressure of about  $10^{-2}$  Torr or less; and

thermally annealing the silicon layer in a nitrogen-containing gas.

46. (amended) A method of forming a gate electrode, comprising the steps of:

depositing a silicon layer onto a gate oxide layer disposed on a silicon substrate by exposing the gate oxide layer to a silicon-containing gas at a partial pressure of about  $10^{-2}$  Torr or less; and

**Replacement Claims**

exposing the silicon layer to a nitrogen-containing gas at a temperature of about 700°C. to about 900°C. to nitridize the silicon layer to a silicon nitride layer.

47. (amended) A method of forming a gate electrode, comprising the steps of:

depositing a silicon layer onto a gate oxide layer disposed on a silicon substrate by exposing the dielectric layer to a silicon-containing gas under low partial pressure; and

exposing the silicon layer to a nitrogen-containing gas at a temperature of about 700°C. to about 900°C., a pressure of about 1 to about 760 Torr, a flow rate of about 100 to about 10,000 sccm, for about 1 second to about 180 minutes to nitridize the silicon layer.

48. (amended) The method of Claim 47, wherein the nitrogen-containing gas is selected from the group consisting of nitrogen, ammonia, nitrogen trifluoride, nitrogen oxide, and a mixture of nitrogen and helium.

49. (amended) A method of forming a gate electrode, comprising the steps of:

depositing a silicon layer onto a gate oxide layer disposed on a silicon substrate by exposing the dielectric layer to a silicon-containing gas at a partial pressure of about  $10^{-2}$  Torr or less; and

exposing the silicon layer to a plasma source of a nitrogen-containing gas to nitridize the silicon layer.

50. (amended) The method of Claim 49, wherein the plasma source of the nitrogen-containing gas is produced by a downstream microwave system, an electron cyclotron resonance system, an inductive coupled plasma system, or a radio frequency system.

51. (amended) A method of forming a gate electrode, comprising the steps of:

depositing a silicon layer onto a gate oxide layer disposed on a silicon substrate by exposing the dielectric layer to a silicon-containing gas at a partial pressure of about  $10^{-2}$  Torr or less; and

○                                   ○

## **Replacement Claims**

exposing the silicon layer to a remote microwave plasma source of a nitrogen-containing gas at a temperature of about 700°C. to about 900°C., and a pressure of about 1 to about 20 Torr to nitridize the silicon layer.

52. (amended) A method of forming a gate electrode, comprising the steps of:

depositing a silicon layer onto a gate oxide layer disposed on a silicon substrate by exposing the dielectric layer to a silicon-containing gas at a partial pressure of about  $10^{-2}$  Torr or less; and

exposing the silicon layer to an inductive coupled plasma source of a nitrogen-containing gas at a pressure of about 1 to about 20 Torr to nitridize the silicon layer.

*B1*  
53. (amended) A method of forming a gate electrode, comprising the steps of:

exposing a gate oxide layer disposed on a silicon substrate to a silicon-containing gas at a partial pressure of about  $10^{-2}$  to about  $10^{-7}$  Torr to nucleate the dielectric layer with a layer of silicon;

nitridizing the silicon layer in a nitrogen-containing gas to form a silicon nitride barrier layer; and

forming a conductive polysilicon layer comprising a conductivity enhancing dopant over the nitride barrier layer; wherein the nitride barrier layer inhibits passage of the dopant from the conductive polysilicon layer therethrough.

54. The method of Claim 53, wherein the polysilicon layer comprises a boron dopant.

55. The method of Claim 53, further comprising:

forming an insulative nitride cap over the conductive polysilicon layer; and  
 patterning the layers to form a gate stack.

56. The method of Claim 53, further comprising:

forming a barrier layer over the doped polysilicon layer;

○                                   ○

## Replacement Claims

forming a conductive metal layer over the barrier layer;  
forming an insulative nitride cap over the conductive metal layer; and  
patterning the layers to form a gate stack.

- B1*
57. The method of Claim 53, further comprising:  
forming a metal silicide layer over the doped polysilicon layer;  
forming an insulative nitride cap over the metal silicide layer; and  
patterning the layers to form a gate stack.
- 
73. A method of forming a nitride barrier layer, comprising the steps of:  
exposing a dielectric layer to a silicon gas under low partial pressure to nucleate the dielectric layer with silicon; and  
exposing the silicon on the dielectric layer to a nitrogen gas to form a silicon nitride barrier layer.

*B2*

74. The method of Claim 73, wherein the silicon on the dielectric layer has a thickness of up to about 30 angstroms.

75. A method of forming a nitride barrier layer, comprising the steps of:  
exposing a dielectric layer to a silicon gas under a low partial pressure of about  $10^{-2}$  Torr or less to nucleate the dielectric layer with silicon; and  
exposing the silicon on the dielectric layer to a nitrogen gas to form a silicon nitride barrier layer.

76. A method of forming a nitride barrier layer, comprising the steps of:  
exposing a dielectric layer to a silicon gas by chemical vapor deposition under a low partial pressure of about  $10^{-2}$  Torr or less to nucleate the dielectric layer with silicon; and  
exposing the silicon on the dielectric layer to a nitrogen gas to form a silicon nitride barrier layer.

**Replacement Claims**

77. The method of Claim 76, wherein the step of exposing the dielectric layer to the silicon gas comprises rapid thermal chemical vapor deposition conducted at about 500°C. to about 700°C. and a partial pressure of about  $10^{-2}$  Torr or less.

78. The method of Claim 76, wherein the step of exposing the dielectric layer to the silicon gas comprises plasma enhanced chemical vapor deposition.

79. The method of Claim 76, wherein the step of exposing the dielectric layer to the silicon gas comprises low pressure chemical vapor deposition.

80. A method of forming a nitride barrier layer, comprising the steps of:

exposing a dielectric layer to a silicon gas under low partial pressure of about  $10^{-2}$  Torr or less to deposit silicon thereon to a thickness of up to about 30 angstroms; and  
exposing the silicon on the dielectric layer to a nitrogen gas to form a silicon nitride barrier layer.

81. A method of forming a nitride barrier layer, comprising the steps of:

exposing a dielectric layer to a silicon gas to nucleate the dielectric layer with silicon; and  
thermally annealing the silicon on the dielectric layer in a nitrogen gas to form a silicon nitride barrier layer.

82. The method of Claim 81, wherein the silicon on the dielectric layer has a thickness of up to about 30 angstroms.

83. A method of forming a nitride barrier layer, comprising the steps of:

exposing a dielectric layer to a silicon gas under low partial pressure of about  $10^{-2}$  or less to deposit silicon thereon to a thickness of up to about 30 angstroms; and

**Replacement Claims**

thermally annealing the silicon on the dielectric layer in a nitrogen gas to form a silicon nitride barrier layer.

84. The method of Claim 83, wherein the step of thermally annealing is conducted at temperature of about 700°C. to about 900°C.

85. A method of forming a nitride barrier layer, comprising the steps of:

exposing a dielectric layer to a silicon gas under low partial pressure of about  $10^{-2}$  Torr or less to deposit silicon thereon to a thickness of up to about 30 angstroms; and

nitridizing the silicon on the dielectric layer with a plasma source of nitrogen to form a silicon nitride barrier layer.

86. A method of forming a gate electrode, comprising the steps of:

*B2*  
exposing a gate oxide layer to a silicon gas under low partial pressure to nucleate the gate oxide layer with silicon; and

exposing the silicon on the gate oxide layer to a nitrogen gas to form a silicon nitride barrier layer over the gate oxide layer.

87. A method of forming a gate electrode, comprising the steps of:

exposing a gate oxide layer to a silicon gas by chemical vapor deposition under a low partial pressure of about  $10^{-2}$  Torr or less to nucleate the gate oxide layer with silicon; and

exposing the silicon on the gate oxide layer to a nitrogen gas to form a silicon nitride barrier layer over the gate oxide layer.

88. A method of forming a gate electrode, comprising the steps of:

exposing a gate oxide layer to a silicon gas under low partial pressure of about  $10^{-2}$  Torr or less to deposit silicon thereon to a thickness of up to about 30 angstroms; and

exposing the silicon on the gate oxide layer to a nitrogen gas to form a silicon nitride barrier layer over the gate oxide layer.

**Replacement Claims**

89. A method of forming a gate electrode, comprising the steps of:  
exposing a gate oxide layer to a silicon gas to nucleate the gate oxide layer with silicon;  
and  
thermally annealing the silicon on the gate oxide layer in a nitrogen gas to form a silicon nitride barrier layer over the gate oxide layer.
90. A method of forming a gate electrode, comprising the steps of:  
exposing a gate oxide layer to a silicon gas under low partial pressure of about  $10^{-2}$  Torr or less to deposit silicon thereon to a thickness of up to about 30 angstroms; and  
thermally annealing the silicon on the gate oxide layer in a nitrogen gas to form a silicon nitride barrier layer over the gate oxide layer.
- B2*
91. A method of forming a gate electrode, comprising the steps of:  
exposing a gate oxide layer to a silicon gas under low partial pressure of about  $10^{-2}$  Torr or less to deposit silicon thereon to a thickness of up to about 30 angstroms; and  
nitridizing the silicon on the gate oxide layer with a plasma source of nitrogen to form a silicon nitride barrier layer over the gate oxide layer.
92. A method of forming a gate electrode, comprising the steps of:  
exposing a gate oxide layer to a silicon gas under low partial pressure of about  $10^{-2}$  Torr or less to nucleate the gate oxide layer with silicon to a thickness of up to about 30 angstroms;  
exposing the silicon on the gate oxide layer to a nitrogen gas to form a silicon nitride barrier layer over the gate oxide layer; and  
forming a conductive layer over the silicon nitride barrier layer.
93. The method of Claim 92, further comprising the steps of forming an insulative nitride layer over the conductive layer; and patterning the layers to form a gate stack.

○                    ○

## Replacement Claims

94. The method of Claim 92, wherein the conductive layer comprises polysilicon comprising a conductivity enhancing dopant, and the nitride barrier layer inhibits passage of the dopant from the conductive polysilicon layer through the barrier layer.

95. The method of Claim 94, further comprising:

forming a barrier layer over the doped polysilicon layer;  
forming a conductive metal layer over the barrier layer;  
forming an insulative nitride layer over the conductive metal layer; and  
patterning the layers to form a gate stack.

*B2*  
*Concid*

96. The method of Claim 94, further comprising:

forming a metal silicide layer over the doped polysilicon layer;  
forming an insulative nitride cap over the metal silicide layer; and  
patterning the layers to form a gate stack.

---

97. (new) The method of Claim 1, wherein the silicon on the dielectric layer has a thickness of up to about 30 angstroms.

98. (new) The method of Claim 1, wherein the silicon-containing gas is selected from the group consisting of dichlorosilane, silicon tetrachloride, silane, and disilane.

*B3*  
99. (new) The method of Claim 1, wherein the step of exposing the dielectric layer to the silicon gas comprises chemical vapor deposition of the silicon gas.

100. (new) The method of Claim 1, wherein the step of exposing the dielectric layer to the silicon gas comprises rapid thermal chemical vapor deposition of the silicon gas.

101. (new) The method of Claim 1, wherein the step of exposing the dielectric layer to the silicon gas comprises plasma enhanced chemical vapor deposition of the silicon gas.

**Replacement Claims**

102. (new) The method of Claim 101, wherein the step of exposing the dielectric layer to the silicon gas comprises low pressure chemical vapor deposition of the silicon gas.

103. (new) The method of Claim 1, wherein the step of exposing the silicon layer comprises thermally annealing the silicon layer in a nitrogen-containing gas.

104. (new) The method of Claim 1, wherein the step of exposing the silicon layer comprises a temperature of about 700°C. to about 900°C.

105. (new) The method of Claim 1, wherein the step of exposing the silicon layer comprises a temperature of about 700°C. to about 900°C., a pressure of about 1 to about 760 Torr, and a flow rate of about 100 to about 10,000 sccm for about 1 second to about 180 minutes.

106. (new) The method of Claim 1, wherein the nitrogen-containing gas is selected from the group consisting of nitrogen, ammonia, nitrogen trifluoride, nitrogen oxide, and a nitrogen-helium mixture.

107. (new) The method of Claim 1, wherein the nitrogen-containing gas comprises a plasma source of nitrogen.

108. (new) The method of Claim 107, wherein the plasma source of the nitrogen is produced by a downstream microwave system, an electron cyclotron resonance system, an inductive coupled plasma system, or a radio frequency system.

109. (new) The method of Claim 1, wherein the step of exposing the silicon layer comprises a remote microwave plasma source of nitrogen.

○                    ○

## Replacement Claims

110. (new) The method of Claim 109, wherein the step of exposing the silicon layer comprises a pressure of about 1 to about 20 Torr, and a temperature of about 700°C. to about 900°C.

111. (new) The method of Claim 1, wherein the step of exposing the silicon layer comprises an inductive coupled plasma source of nitrogen.

112. (new) The method of Claim 1, wherein the step of exposing the dielectric layer comprises a partial pressure of about  $10^{-2}$  to about  $10^{-7}$  Torr, a temperature of about 500°C. to about 700°C., and a duration of about 1 second to about 5 minutes.

113. (new) The method of Claim 1, wherein the dielectric layer comprises a gate oxide layer.

114. (new) The method of Claim 1, further comprising: forming a conductive layer over the silicon nitride barrier layer.

115. (new) The method of Claim 114, wherein the conductive layer comprises a conductive polysilicon.

116. (new) The method of Claim 115, wherein the conductive polysilicon layer comprises a conductivity enhancing dopant, and the nitride barrier layer inhibits passage of the dopant from the conductive polysilicon layer therethrough.

117. (new) The method of Claim 116, wherein the polysilicon layer comprises a boron dopant.

118. (new) The method of Claim 114, further comprising: forming an insulative nitride cap over the conductive layer.

119. (new) The method of Claim 118, further comprising: patterning the layers to form a gate stack.

## **Replacement Claims**

120. (new) The method of Claim 116, further comprising:  
    forming a barrier layer over the doped polysilicon layer;  
    forming a conductive metal layer over the barrier layer;  
*P3*  
    forming an insulative nitride cap over the conductive metal layer; and  
     patterning the layers to form a gate stack.

- Conc'd*  
121. (new) The method of Claim 116, further comprising:  
    forming a metal silicide layer over the doped polysilicon layer;  
    forming an insulative nitride cap over the metal silicide layer; and  
     patterning the layers to form a gate stack.
-

**WHAT IS CLAIMED IS:**

1. (amended) A method of forming a nitride barrier layer, comprising the steps of:
  - exposing a dielectric layer to a silicon-containing species gas under low partial pressure to deposit a layer of silicon thereon; and
  - exposing the silicon layer to a nitrogen-containing species gas to form a silicon nitride barrier layer.
2. (amended) The method of Claim 1, wherein the dielectric layer is exposed to the silicon-containing species gas at a partial pressure of about  $10^{-2}$  Torr or less.
3. (amended) The method of Claim 1, wherein the dielectric layer is exposed to the silicon-containing species gas at pressure of about  $10^{-2}$  to about  $10^{-7}$  Torr.
4. (amended) The method of Claim 2, wherein the dielectric layer is exposed to the silicon-containing species gas at a temperature of about 500°C to about 700°C.
5. (amended) A method of forming a nitride barrier layer, comprising the steps of:
  - irradiating a dielectric layer with a silicon-containing species gas under low partial pressure to nucleate the dielectric layer with a layer of silicon; and
  - exposing the silicon layer to a nitrogen-containing species gas to form a silicon nitride barrier layer.
6. The method of Claim 5, wherein the silicon layer has a thickness of about 10 to about 30 angstroms.
7. (amended) A method of forming a nitride barrier layer, comprising the steps of:
  - exposing a dielectric layer to a silicon-containing species gas under low partial pressure to deposit a layer of about 10 to about 30 angstroms silicon thereon; and

**Blacklined Claims**

nitridizing the silicon layer in a nitrogen-containing ~~species~~ gas to form a silicon nitride barrier layer.

8. (amended) A method of forming a nitride barrier layer, comprising the steps of:

exposing a surface of a dielectric layer to a silicon-containing ~~species~~ gas at a low partial pressure to nucleate the surface of the dielectric layer with a layer of silicon; and

exposing the silicon layer to a nitrogen-containing ~~species~~ gas to form a silicon nitride barrier layer.

9. (amended) A method of forming a nitride barrier layer, comprising the steps of:

exposing a dielectric layer to a silicon-containing ~~species~~ gas at a partial pressure of about  $10^{-2}$  Torr or less to deposit a layer of about 10 to about 30 angstroms silicon thereon; and  
nitridizing the silicon layer to form a silicon nitride barrier layer.

10. (amended) The method of Claim 9, wherein the dielectric layer is exposed to the silicon-containing ~~species~~ gas at a temperature of about 500°C to about 700°C.

11. (amended) The method of Claim 9, wherein the silicon-containing ~~species~~ gas is selected from the group consisting of dichlorosilane, silicon tetrachloride, silane, and disilane.

12. (amended) The method of Claim 9, wherein the step of exposing the dielectric layer to the silicon-containing ~~species~~ gas is by plasma enhanced chemical vapor deposition, low pressure chemical vapor deposition, or rapid thermal chemical vapor deposition.

13. (amended) The method of Claim 9, wherein the silicon-containing ~~species~~ gas is deposited by rapid thermal chemical vapor deposition at about 500°C. to about 700°C.

14. The method of Claim 9, wherein the dielectric layer comprises silicon dioxide.

**Blacklined Claims**

15. The method of Claim 9, wherein the dielectric layer comprises a dielectric material selected from the group consisting of tantalum pentoxide, hafnium dioxide, and aluminum trioxide.

16. (amended) A method of forming a nitride barrier layer, comprising the steps of:

exposing a dielectric layer to a silicon-containing species gas at a partial pressure of about  $10^{-2}$  to about  $10^{-7}$  Torr to nucleate the dielectric layer with a layer of silicon; and

exposing the silicon layer to a nitrogen-containing species gas to form a silicon nitride barrier layer.

17. (amended) A method of forming a nitride barrier layer, comprising the steps of:

exposing a dielectric layer to a silicon-containing species gas at a partial pressure of about  $10^{-2}$  to about  $10^{-7}$  Torr, a temperature of about 500°C. to about 700°C., and a duration of about 1 second to about 5 minutes, to nucleate the dielectric layer with a layer of silicon; and

exposing the silicon layer to a nitrogen-containing species gas to form a silicon nitride barrier layer.

18. (amended) A method of forming a nitride barrier layer, comprising the steps of:

depositing a silicon layer onto a dielectric layer by exposing the dielectric layer to a silicon-containing species gas under low partial pressure; and

thermally annealing the silicon layer in a nitrogen-containing species. gas,

19. (amended) A method of forming a nitride barrier layer, comprising the steps of:

depositing a silicon layer onto a dielectric layer by exposing the dielectric layer to a silicon-containing species gas under low partial pressure; and

exposing the silicon layer to a nitrogen-containing species gas at a temperature of about 700°C. to about 900°C. to nitridize the silicon layer.

**Blacklined Claims**

20. (amended) A method of forming a nitride barrier layer, comprising the steps of:

depositing a silicon layer onto a dielectric layer by exposing the dielectric layer to a silicon-containing species gas under low partial pressure; and

exposing the silicon layer to a nitrogen-containing species gas at a temperature of about 700°C. to about 900°C., a pressure of about 1 to about 760 Torr, and a flow rate of about 100 to about 10,000 sccm, for about 1 second to about 180 minutes to nitridize the silicon layer.

221. (amended) The method of Claim 20, wherein the nitrogen-containing species gas is selected from the group consisting of nitrogen, ammonia, nitrogen trifluoride, nitrogen oxide, and a nitrogen-helium mixture.

22. The method of Claim 21, wherein the silicon layer is exposed to a plasma source of nitrogen.

23. (amended) A method of forming a nitride barrier layer, comprising the steps of:

depositing a silicon layer onto a dielectric layer by exposing the dielectric layer to a silicon-containing species gas under low partial pressure; and

exposing the silicon layer to a plasma source of a nitrogen-containing species gas to nitridize the silicon layer.

24. (amended) The method of Claim 23, wherein the plasma source of the nitrogen-containing species gas is produced by a downstream microwave system, an electron cyclotron residence system, an inductive coupled plasma system, or a radio frequency system.

25. (amended) A method of forming a nitride barrier layer, comprising the steps of:

depositing a silicon layer onto a dielectric layer by exposing the dielectric layer to a silicon-containing species gas under low partial pressure; and

exposing the silicon layer to a remote microwave plasma source of a nitrogen-containing species gas at a pressure of about 1 to about 20 Torr to nitridize the silicon layer.

**Blacklined Claims**

26. (amended) A method of forming a nitride barrier layer, comprising the steps of:  
depositing a silicon layer onto a dielectric layer by exposing the dielectric layer to a silicon-containing species gas under low partial pressure; and  
exposing the silicon layer to a remote microwave plasma source of a nitrogen-containing species gas at a pressure of about 1 to about 20 Torr, and a temperature of about 700°C. to about 900°C. to nitridize the silicon layer.
27. (amended) A method of forming a nitride barrier layer, comprising the steps of:  
depositing a silicon layer onto a dielectric layer by exposing the dielectric layer to a silicon-containing species gas under low partial pressure; and  
exposing the silicon layer to an inductive coupled plasma source of a nitrogen-containing species gas at a pressure of about 1 to about 20 Torr to nitridize the silicon layer.
28. (amended) A method of forming a semiconductor device, comprising the steps of:  
irradiating a dielectric layer disposed on a silicon substrate with a silicon-containing species gas under low partial pressure to nucleate the dielectric layer with a layer of silicon; and  
nitridizing the silicon layer.
29. (amended) The method of Claim 28, wherein the step of irradiating the dielectric layer with the silicon-containing species gas is at a partial pressure about  $10^{-2}$  Torr or less.
30. The method of Claim 29, wherein the step of irradiating the dielectric layer is at a partial pressure of about  $10^{-2}$  to about  $10^{-7}$  Torr.
31. (amended) The method of Claim 29, wherein the silicon-containing species gas is selected from the group consisting of dichlorosilane, silicon tetrachloride, silane, and disilane.

**Blacklined Claims**

32. (amended) The method of Claim 28, wherein the step of irradiating the dielectric layer with the silicon-containing species gas is by plasma enhanced chemical vapor deposition, low pressure chemical vapor deposition, or rapid thermal chemical vapor deposition.

33. (amended) The method of Claim 28, wherein the step of irradiating the dielectric layer with the silicon-containing species gas is by rapid thermal chemical vapor deposition at a temperature of about 500°C to about 700°C.

34. The method of Claim 28, wherein the dielectric layer comprises silicon dioxide.

35. The method of Claim 28, wherein the dielectric layer comprises a dielectric material selected from the group consisting of tantalum pentoxide, hafnium dioxide, and aluminum trioxide.

36. (amended) A method of forming a semiconductor device, comprising the steps of:  
exposing a dielectric layer disposed on a silicon substrate to a silicon-containing species gas at a partial pressure of about  $10^{-2}$  Torr or less to nucleate the dielectric layer with a layer of silicon; and  
nitridizing the silicon layer in a nitrogen-containing species. gas.

37. (amended) A method of forming a semiconductor device, comprising the steps of:  
exposing an oxide layer disposed on a silicon substrate to a silicon-containing species gas at a partial pressure of about  $10^{-2}$  Torr or less to nucleate the dielectric layer with a layer of silicon; and  
thermally annealing the silicon layer in a nitrogen-containing gas.

**Blacklined Claims**

38. (amended) A method of forming a semiconductor device, comprising the steps of:

exposing an oxide layer disposed on a silicon substrate to a silicon-containing species gas at a partial pressure of about  $10^{-2}$  Torr or less to nucleate the dielectric layer with a layer of silicon; and

exposing the silicon layer to a nitrogen-containing species gas at a temperature of about 700°C. to about 900°C. to nitridize the silicon layer.

39. (amended) A method of forming a semiconductor device, comprising the steps of:

depositing a silicon layer onto a dielectric layer by exposing the dielectric layer to a silicon-containing species gas under low partial pressure to nucleate the dielectric layer with a layer of silicon; and

exposing the silicon layer to a plasma source of a nitrogen-containing species gas to nitridize the silicon layer.

40. (amended) The method of Claim 39, wherein the plasma source of the nitrogen-containing species gas is produced by a downstream microwave system, an electron cyclotron residence system, an inductive coupled plasma system, or a radio frequency system.

41. (amended) A method of forming a semiconductor device, comprising the steps of:

depositing a silicon layer onto a dielectric layer by exposing the dielectric layer to a silicon-containing species gas under low a partial pressure of about  $10^{-2}$  Torr or less to nucleate the dielectric layer with a layer of silicon; and

exposing the silicon layer to a remote microwave plasma source of a nitrogen-containing species gas at a pressure of about 1 to about 20 Torr to nitridize the silicon layer.

42. (amended) A method of forming a gate electrode, comprising the steps of:

exposing a gate oxide layer disposed on a silicon substrate to a silicon-containing species gas at a partial pressure of about  $10^{-2}$  Torr or less to nucleate the dielectric layer with a layer silicon; and

**Blacklined Claims**

exposing the silicon layer to a nitrogen-containing species gas to form a silicon nitride barrier layer.

43. (amended) A method of forming a gate electrode, comprising the steps of:

    exposing a gate oxide layer disposed on a silicon substrate to a silicon-containing species gas at a partial pressure of about  $10^{-2}$  to about  $10^{-7}$  Torr to nucleate the dielectric layer with a layer of silicon; and

    exposing the silicon layer to a nitrogen-containing species gas to form a silicon nitride barrier layer.

44. (amended) A method of forming a gate electrode, comprising the steps of:

    exposing a gate oxide layer disposed on a silicon substrate to a silicon-containing species gas at a partial pressure of about  $10^{-2}$  to about  $10^{-7}$  Torr, a temperature of about 500°C. to about 700°C., and a duration of about 1 second to about 5 minutes, to nucleate the dielectric layer with a layer of silicon and

    exposing the silicon layer to a nitrogen-containing species gas to form a silicon nitride barrier layer.

45. (amended) A method of forming a gate electrode, comprising the steps of:

    depositing a silicon layer onto a gate oxide layer disposed on a silicon substrate by exposing the gate oxide layer to a silicon-containing species gas at a partial pressure of about  $10^{-2}$  Torr or less; and

    thermally annealing the silicon layer in a nitrogen-containing species. gas.

46. (amended) A method of forming a gate electrode, comprising the steps of:

    depositing a silicon layer onto a gate oxide layer disposed on a silicon substrate by exposing the gate oxide layer to a silicon-containing species gas at a partial pressure of about  $10^{-2}$  Torr or less; and

**Blacklined Claims**

exposing the silicon layer to a nitrogen-containing species gas at a temperature of about 700°C. to about 900°C. to nitridize the silicon layer to a silicon nitride layer.

47. (amended) A method of forming a gate electrode, comprising the steps of:

depositing a silicon layer onto a gate oxide layer disposed on a silicon substrate by exposing the dielectric layer to a silicon-containing species gas under low partial pressure; and

exposing the silicon layer to a nitrogen-containing species gas at a temperature of about 700°C. to about 900°C., a pressure of about 1 to about 760 Torr, a flow rate of about 100 to about 10,000 sccm, for about 1 second to about 180 minutes to nitridize the silicon layer.

48. (amended) The method of Claim 47, wherein the nitrogen-containing species gas is selected from the group consisting of nitrogen, ammonia, nitrogen trifluoride, nitrogen oxide, and a mixture of nitrogen and helium.

49. (amended) A method of forming a gate electrode, comprising the steps of:

depositing a silicon layer onto a gate oxide layer disposed on a silicon substrate by exposing the dielectric layer to a silicon-containing species gas at a partial pressure of about  $10^{-2}$  Torr or less; and

exposing the silicon layer to a plasma source of a nitrogen-containing species gas to nitridize the silicon layer.

50. (amended) The method of Claim 49, wherein the plasma source of the nitrogen-containing species gas is produced by a downstream microwave system, an electron cyclotron resonance system, an inductive coupled plasma system, or a radio frequency system.

51. (amended) A method of forming a gate electrode, comprising the steps of:

depositing a silicon layer onto a gate oxide layer disposed on a silicon substrate by exposing the dielectric layer to a silicon-containing species gas at a partial pressure of about  $10^{-2}$  Torr or less; and

**Blacklined Claims**

exposing the silicon layer to a remote microwave plasma source of a nitrogen-containing species gas at a temperature of about 700°C. to about 900°C., and a pressure of about 1 to about 20 Torr to nitridize the silicon layer.

52. (amended) A method of forming a gate electrode, comprising the steps of:

depositing a silicon layer onto a gate oxide layer disposed on a silicon substrate by exposing the dielectric layer to a silicon-containing species gas at a partial pressure of about  $10^{-2}$  Torr or less; and

exposing the silicon layer to an inductive coupled plasma source of a nitrogen-containing species gas at a pressure of about 1 to about 20 Torr to nitridize the silicon layer.

53. (amended) A method of forming a gate electrode, comprising the steps of:

exposing a gate oxide layer disposed on a silicon substrate to a silicon-containing species gas at a partial pressure of about  $10^{-2}$  to about  $10^{-7}$  Torr to nucleate the dielectric layer with a layer of silicon;

nitridizing the silicon layer in a nitrogen-containing species gas to form a silicon nitride barrier layer; and

forming a conductive polysilicon layer comprising a conductivity enhancing dopant over the nitride barrier layer; wherein the nitride barrier layer inhibits passage of the dopant from the conductive polysilicon layer therethrough.

54. The method of Claim 53, wherein the polysilicon layer comprises a boron dopant.

55. The method of Claim 53, further comprising:

forming an insulative nitride cap over the conductive polysilicon layer; and  
 patterning the layers to form a gate stack.

56. The method of Claim 53, further comprising:

forming a barrier layer over the doped polysilicon layer;

**Blacklined Claims**

forming a conductive metal layer over the barrier layer;  
forming an insulative nitride cap over the conductive metal layer; and  
 patterning the layers to form a gate stack.

57. The method of Claim 53, further comprising:  
 forming a metal silicide layer over the doped polysilicon layer;  
 forming an insulative nitride cap over the metal silicide layer; and  
 patterning the layers to form a gate stack.
73. (new) A method of forming a nitride barrier layer, comprising the steps of:  
 exposing a dielectric layer to a silicon gas under low partial pressure to nucleate the dielectric layer with silicon; and  
 exposing the silicon on the dielectric layer to a nitrogen gas to form a silicon nitride barrier layer.
74. (new) The method of Claim 73, wherein the silicon on the dielectric layer has a thickness of up to about 30 angstroms.
75. (new) A method of forming a nitride barrier layer, comprising the steps of:  
 exposing a dielectric layer to a silicon gas under a low partial pressure of about  $10^{-2}$  Torr or less to nucleate the dielectric layer with silicon; and  
 exposing the silicon on the dielectric layer to a nitrogen gas to form a silicon nitride barrier layer.
76. (new) A method of forming a nitride barrier layer, comprising the steps of:  
 exposing a dielectric layer to a silicon gas by chemical vapor deposition under a low partial pressure of about  $10^{-2}$  Torr or less to nucleate the dielectric layer with silicon; and  
 exposing the silicon on the dielectric layer to a nitrogen gas to form a silicon nitride barrier layer.

**Blacklined Claims**

77. (new) The method of Claim 76, wherein the step of exposing the dielectric layer to the silicon gas comprises rapid thermal chemical vapor deposition conducted at about 500°C. to about 700°C. and a partial pressure of about  $10^{-2}$  Torr or less.

78. (new) The method of Claim 76, wherein the step of exposing the dielectric layer to the silicon gas comprises plasma enhanced chemical vapor deposition.

79. (new) The method of Claim 76, wherein the step of exposing the dielectric layer to the silicon gas comprises low pressure chemical vapor deposition.

80. (new) A method of forming a nitride barrier layer, comprising the steps of:  
exposing a dielectric layer to a silicon gas under low partial pressure of about  $10^{-2}$  Torr or less to deposit silicon thereon to a thickness of up to about 30 angstroms; and  
exposing the silicon on the dielectric layer to a nitrogen gas to form a silicon nitride barrier layer.

81. (new) A method of forming a nitride barrier layer, comprising the steps of:  
exposing a dielectric layer to a silicon gas to nucleate the dielectric layer with silicon; and  
thermally annealing the silicon on the dielectric layer in a nitrogen gas to form a silicon nitride barrier layer.

82. (new) The method of Claim 81, wherein the silicon on the dielectric layer has a thickness of up to about 30 angstroms.

83. (new) A method of forming a nitride barrier layer, comprising the steps of:  
exposing a dielectric layer to a silicon gas under low partial pressure of about  $10^{-2}$  or less to deposit silicon thereon to a thickness of up to about 30 angstroms; and

**Blacklined Claims**

thermally annealing the silicon on the dielectric layer in a nitrogen gas to form a silicon nitride barrier layer.

84. (new)–The method of Claim 83, wherein the step of thermally annealing is conducted at temperature of about 700°C. to about 900°C.

85. (new)–A method of forming a nitride barrier layer, comprising the steps of:

exposing a dielectric layer to a silicon gas under low partial pressure of about  $10^{-2}$  Torr or less to deposit silicon thereon to a thickness of up to about 30 angstroms; and

nitridizing the silicon on the dielectric layer with a plasma source of nitrogen to form a silicon nitride barrier layer.

86. (new)–A method of forming a gate electrode, comprising the steps of:

exposing a gate oxide layer to a silicon gas under low partial pressure to nucleate the gate oxide layer with silicon; and

exposing the silicon on the gate oxide layer to a nitrogen gas to form a silicon nitride barrier layer over the gate oxide layer.

87. (new)–A method of forming a gate electrode, comprising the steps of:

exposing a gate oxide layer to a silicon gas by chemical vapor deposition under a low partial pressure of about  $10^{-2}$  Torr or less to nucleate the gate oxide layer with silicon; and

exposing the silicon on the gate oxide layer to a nitrogen gas to form a silicon nitride barrier layer over the gate oxide layer.

88. (new)–A method of forming a gate electrode, comprising the steps of:

exposing a gate oxide layer to a silicon gas under low partial pressure of about  $10^{-2}$  Torr or less to deposit silicon thereon to a thickness of up to about 30 angstroms; and

exposing the silicon on the gate oxide layer to a nitrogen gas to form a silicon nitride barrier layer over the gate oxide layer.

**Blacklined Claims**

89. (new) A method of forming a gate electrode, comprising the steps of:  
exposing a gate oxide layer to a silicon gas to nucleate the gate oxide layer with silicon;  
and  
thermally annealing the silicon on the gate oxide layer in a nitrogen gas to form a silicon nitride barrier layer over the gate oxide layer.
90. (new) A method of forming a gate electrode, comprising the steps of:  
exposing a gate oxide layer to a silicon gas under low partial pressure of about  $10^{-2}$  Torr or less to deposit silicon thereon to a thickness of up to about 30 angstroms; and  
thermally annealing the silicon on the gate oxide layer in a nitrogen gas to form a silicon nitride barrier layer over the gate oxide layer.
91. (new) A method of forming a gate electrode, comprising the steps of:  
exposing a gate oxide layer to a silicon gas under low partial pressure of about  $10^{-2}$  Torr or less to deposit silicon thereon to a thickness of up to about 30 angstroms; and  
nitridizing the silicon on the gate oxide layer with a plasma source of nitrogen to form a silicon nitride barrier layer over the gate oxide layer.
92. (new) A method of forming a gate electrode, comprising the steps of:  
exposing a gate oxide layer to a silicon gas under low partial pressure of about  $10^{-2}$  Torr or less to nucleate the gate oxide layer with silicon to a thickness of up to about 30 angstroms;  
exposing the silicon on the gate oxide layer to a nitrogen gas to form a silicon nitride barrier layer over the gate oxide layer; and  
forming a conductive layer over the silicon nitride barrier layer.
93. (new) The method of Claim 92, further comprising the steps of forming an insulative nitride layer over the conductive layer; and patterning the layers to form a gate stack.

**Blacklined Claims**

94. (new)–The method of Claim 92, wherein the conductive layer comprises polysilicon comprising a conductivity enhancing dopant, and the nitride barrier layer inhibits passage of the dopant from the conductive polysilicon layer through the barrier layer.

95. (new)–The method of Claim 94, further comprising:

forming a barrier layer over the doped polysilicon layer;  
forming a conductive metal layer over the barrier layer;  
forming an insulative nitride layer over the conductive metal layer; and  
patterning the layers to form a gate stack.

96. (new)–The method of Claim 94, further comprising:

forming a metal silicide layer over the doped polysilicon layer;  
forming an insulative nitride cap over the metal silicide layer; and  
patterning the layers to form a gate stack.

97. (new) The method of Claim 1, wherein the silicon on the dielectric layer has a thickness of up to about 30 angstroms.

98. (new) The method of Claim 1, wherein the silicon-containing gas is selected from the group consisting of dichlorosilane, silicon tetrachloride, silane, and disilane.

99. (new) The method of Claim 1, wherein the step of exposing the dielectric layer to the silicon gas comprises chemical vapor deposition of the silicon gas.

100. (new) The method of Claim 1, wherein the step of exposing the dielectric layer to the silicon gas comprises rapid thermal chemical vapor deposition of the silicon gas.

101. (new) The method of Claim 1, wherein the step of exposing the dielectric layer to the silicon gas comprises plasma enhanced chemical vapor deposition of the silicon gas.

**Blacklined Claims**

102. (new) The method of Claim 101, wherein the step of exposing the dielectric layer to the silicon gas comprises low pressure chemical vapor deposition of the silicon gas.

103. (new) The method of Claim 1, wherein the step of exposing the silicon layer comprises thermally annealing the silicon layer in a nitrogen-containing gas.

104. (new) The method of Claim 1, wherein the step of exposing the silicon layer comprises a temperature of about 700°C. to about 900°C.

105. (new) The method of Claim 1, wherein the step of exposing the silicon layer comprises a temperature of about 700°C. to about 900°C., a pressure of about 1 to about 760 Torr, and a flow rate of about 100 to about 10,000 sccm for about 1 second to about 180 minutes.

106. (new) The method of Claim 1, wherein the nitrogen-containing gas is selected from the group consisting of nitrogen, ammonia, nitrogen trifluoride, nitrogen oxide, and a nitrogen-helium mixture.

107. (new) The method of Claim 1, wherein the nitrogen-containing gas comprises a plasma source of nitrogen.

108. (new) The method of Claim 107, wherein the plasma source of the nitrogen is produced by a downstream microwave system, an electron cyclotron resonance system, an inductive coupled plasma system, or a radio frequency system.

109. (new) The method of Claim 1, wherein the step of exposing the silicon layer comprises a remote microwave plasma source of nitrogen.

**Blacklined Claims**

110. (new) The method of Claim 109, wherein the step of exposing the silicon layer comprises a pressure of about 1 to about 20 Torr, and a temperature of about 700°C. to about 900°C.

111. (new) The method of Claim 1, wherein the step of exposing the silicon layer comprises an inductive coupled plasma source of nitrogen.

112. (new) The method of Claim 1, wherein the step of exposing the dielectric layer comprises a partial pressure of about  $10^{-2}$  to about  $10^{-7}$  Torr, a temperature of about 500°C. to about 700°C., and a duration of about 1 second to about 5 minutes.

113. (new) The method of Claim 1, wherein the dielectric layer comprises a gate oxide layer.

114. (new) The method of Claim 1, further comprising: forming a conductive layer over the silicon nitride barrier layer.

115. (new) The method of Claim 114, wherein the conductive layer comprises a conductive polysilicon.

116. (new) The method of Claim 115, wherein the conductive polysilicon layer comprises a conductivity enhancing dopant, and the nitride barrier layer inhibits passage of the dopant from the conductive polysilicon layer therethrough.

117. (new) The method of Claim 116, wherein the polysilicon layer comprises a boron dopant.

118. (new) The method of Claim 114, further comprising: forming an insulative nitride cap over the conductive layer.

119. (new) The method of Claim 118, further comprising: patterning the layers to form a gate stack.

**Blacklined Claims**

120. (new) The method of Claim 116, further comprising:

forming a barrier layer over the doped polysilicon layer;  
forming a conductive metal layer over the barrier layer;  
forming an insulative nitride cap over the conductive metal layer; and  
patterning the layers to form a gate stack.

121. (new) The method of Claim 116, further comprising:

forming a metal silicide layer over the doped polysilicon layer;  
forming an insulative nitride cap over the metal silicide layer; and  
patterning the layers to form a gate stack.